

Figure 1

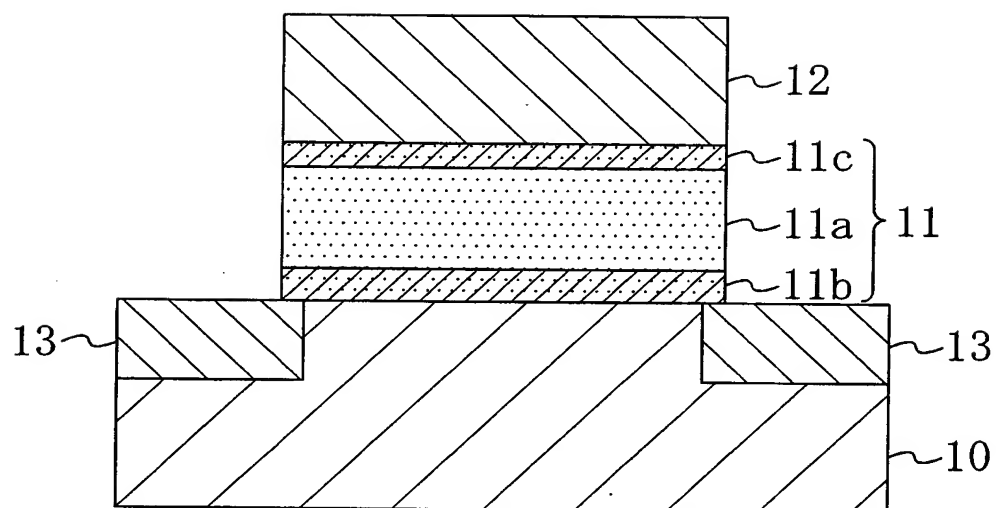


Figure 2

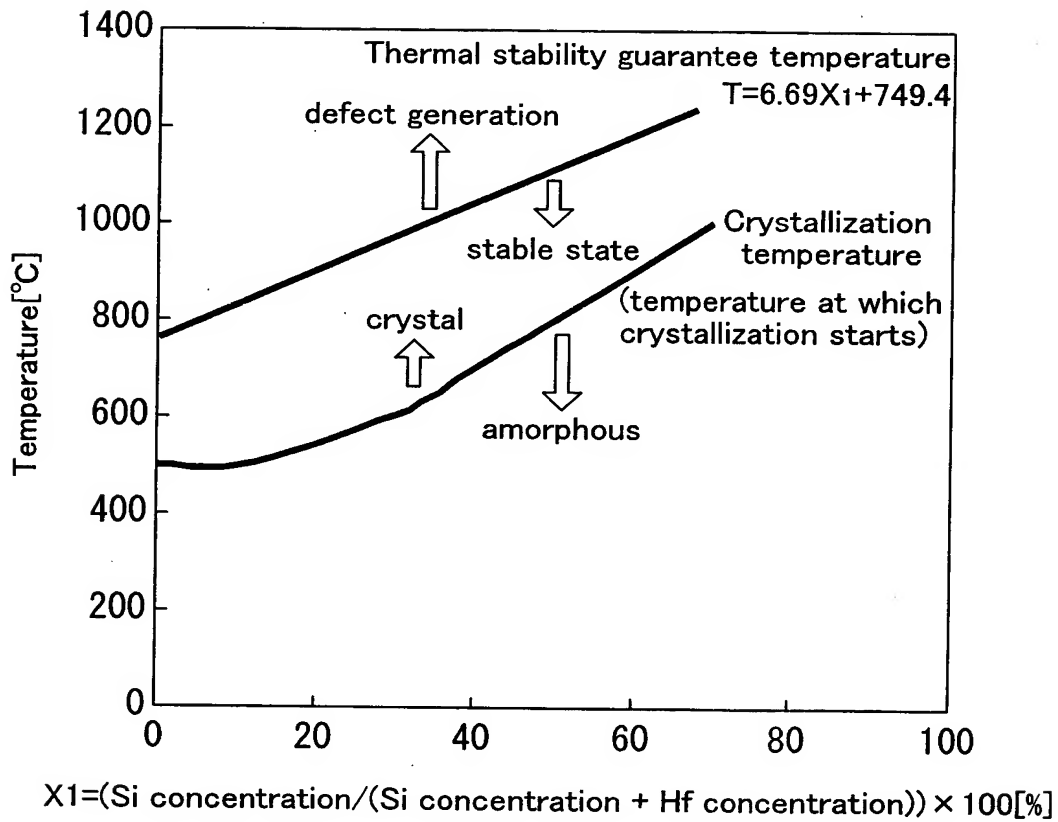


Figure 3

A	B
750	≥ 0.1
800	≥ 7.6
850	≥ 15.0
900	≥ 23.0
950	≥ 30.0
1000	≥ 37.5
1050	≥ 45.0
1100	≥ 52.4

A:Maximum process temperature

B:Practical range of

$(\text{Si concentration} / (\text{Si concentration} + \text{Hf concentration})) \times 100[\%]$,
in which the thermal stability of Hf silicate can be ensured.

Figure 4

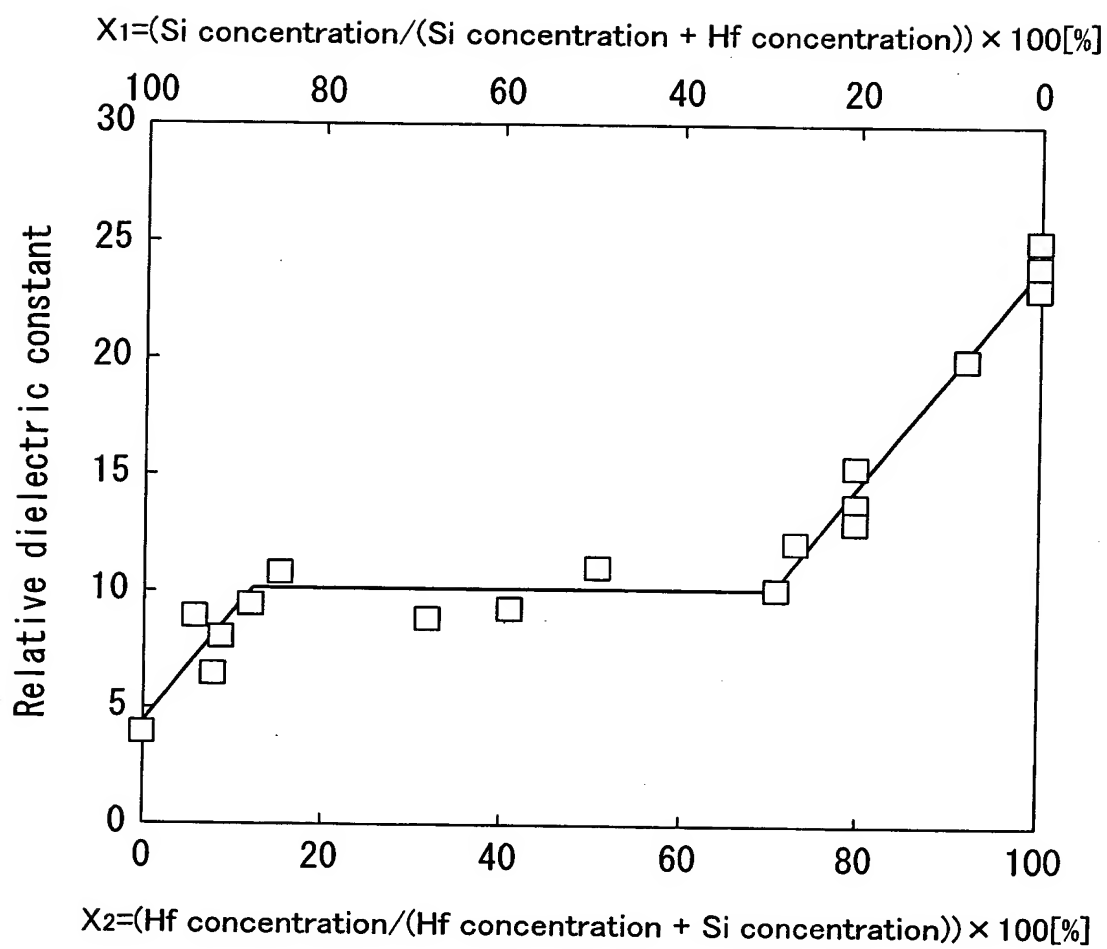
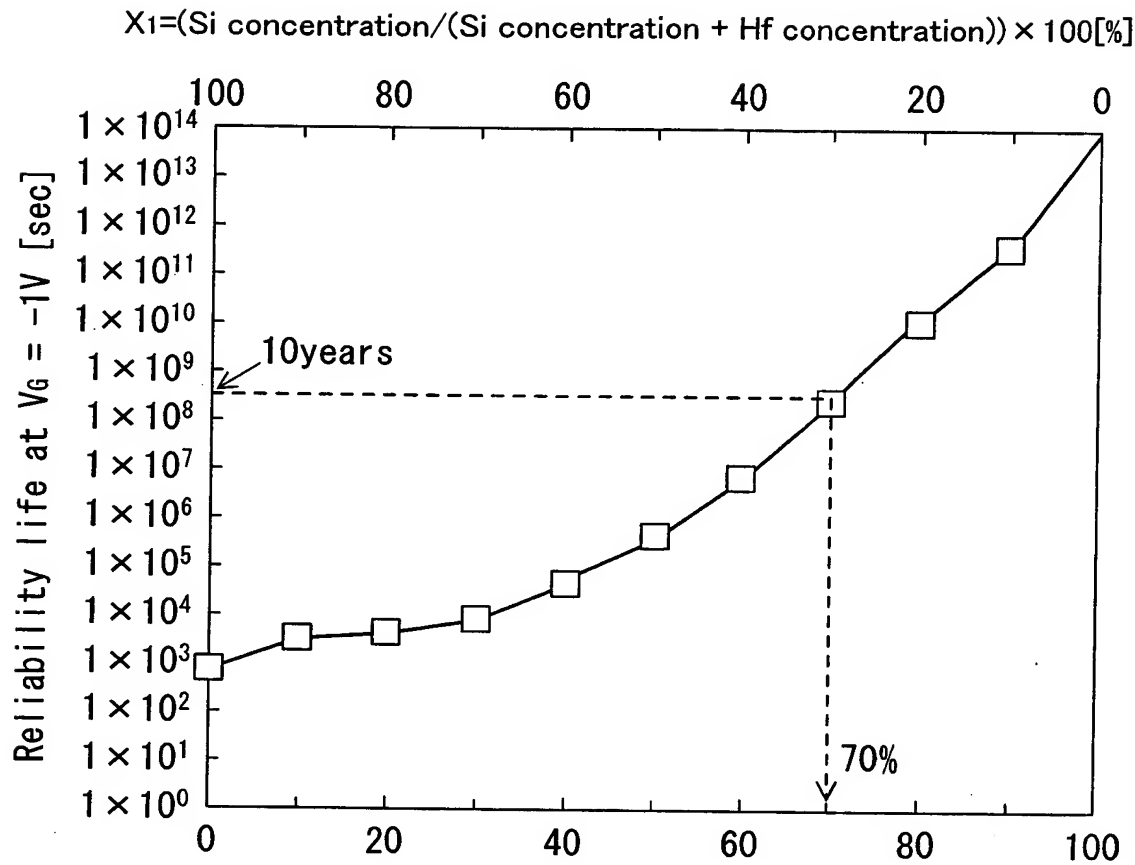


Figure 5



$X_2 = (\text{Hf concentration} / (\text{Hf concentration} + \text{Si concentration})) \times 100[\%]$

Eox (real) model
 EOT=1.5nm
 Incidence of failure=100ppm
 MOS area =0.1cm²
 Temperature=100°C

Figure 6

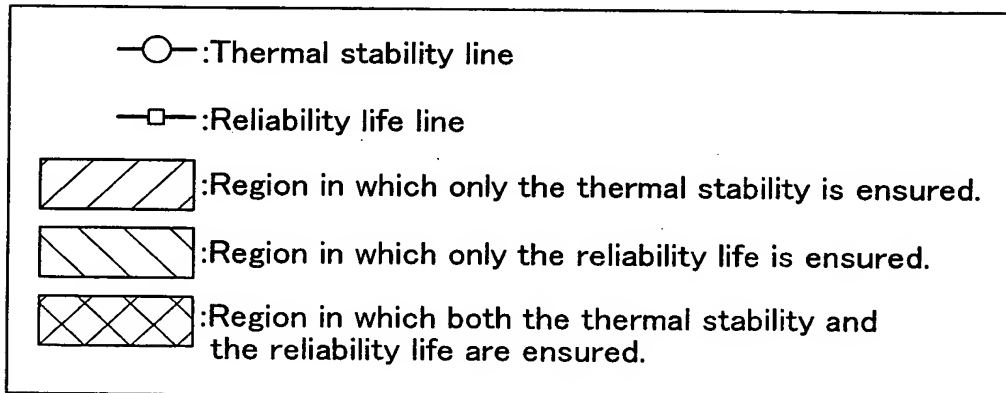
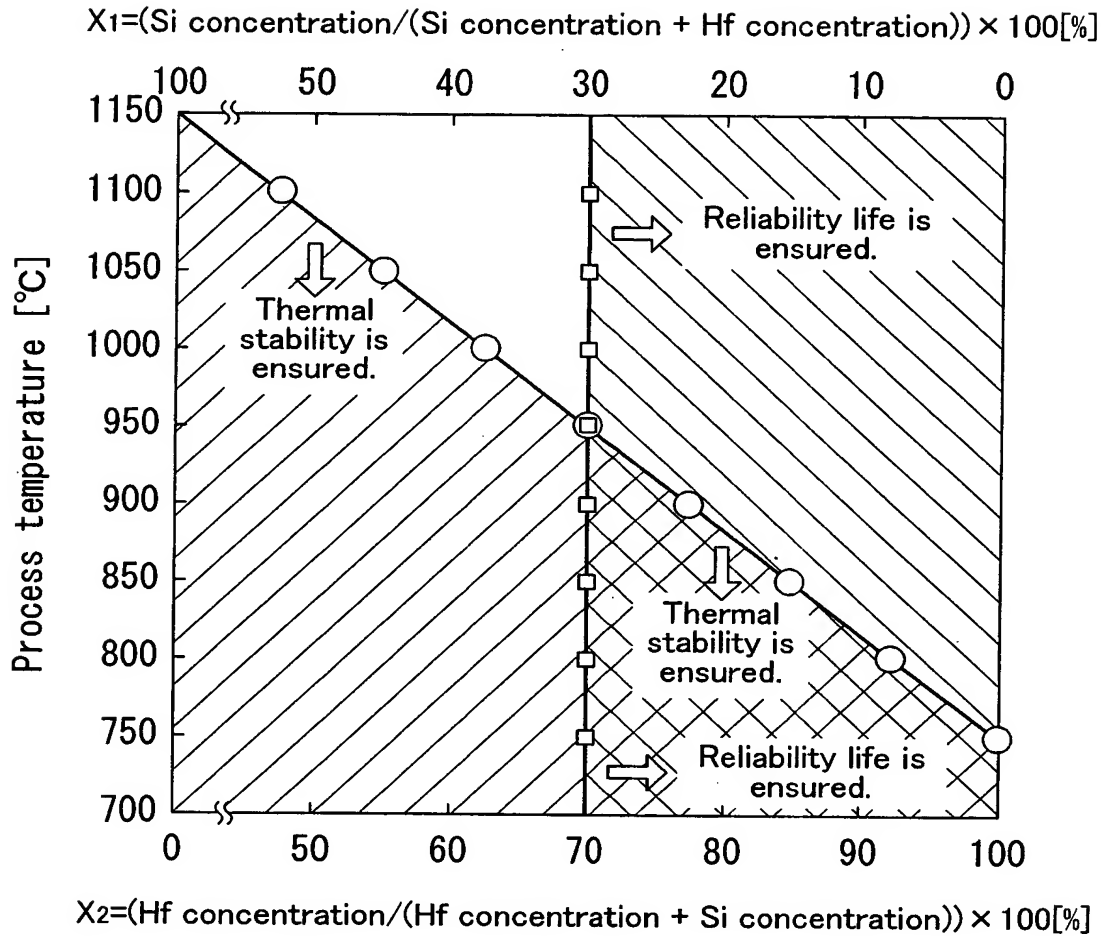


Figure 7A

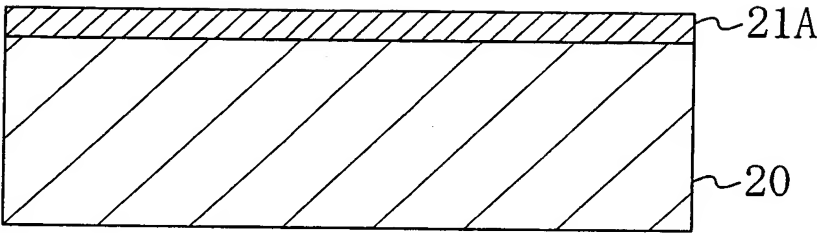


Figure 7B

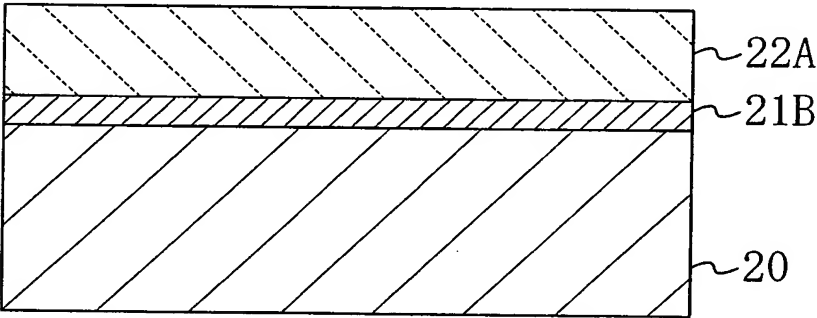


Figure 7C

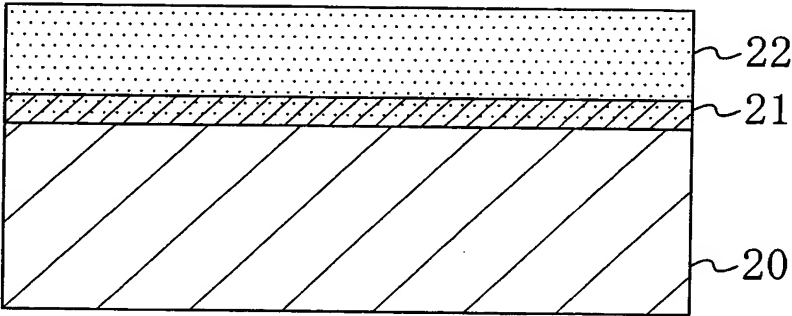


Figure 8A

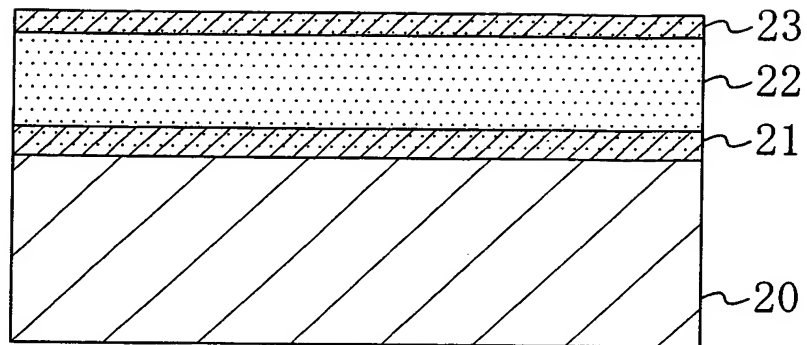


Figure 8B

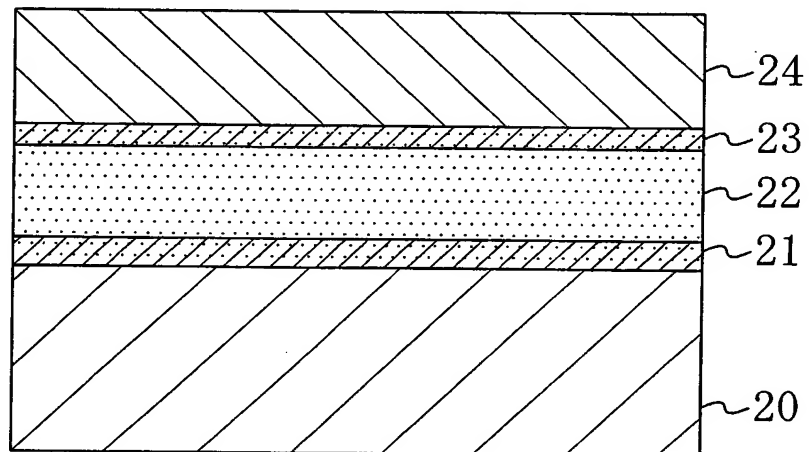


Figure 8C

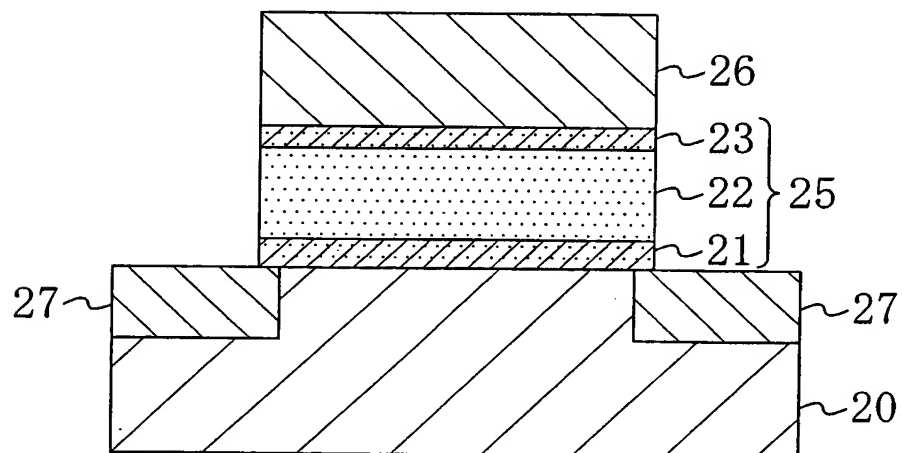


Figure 9A

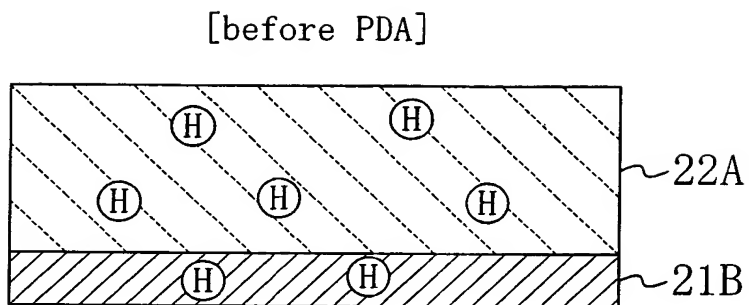


Figure 9B

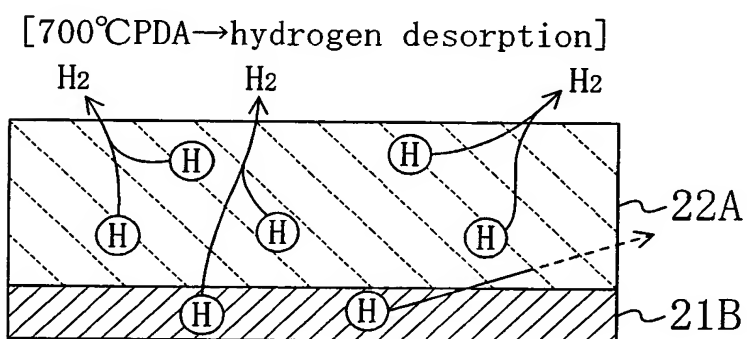


Figure 9C

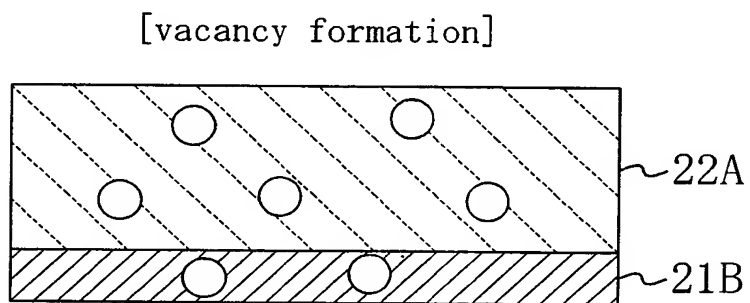


Figure 9D

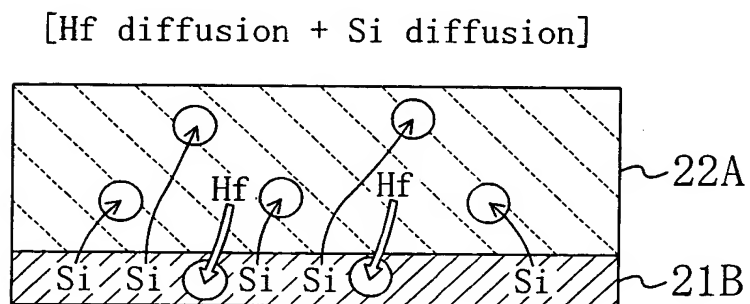


Figure 10

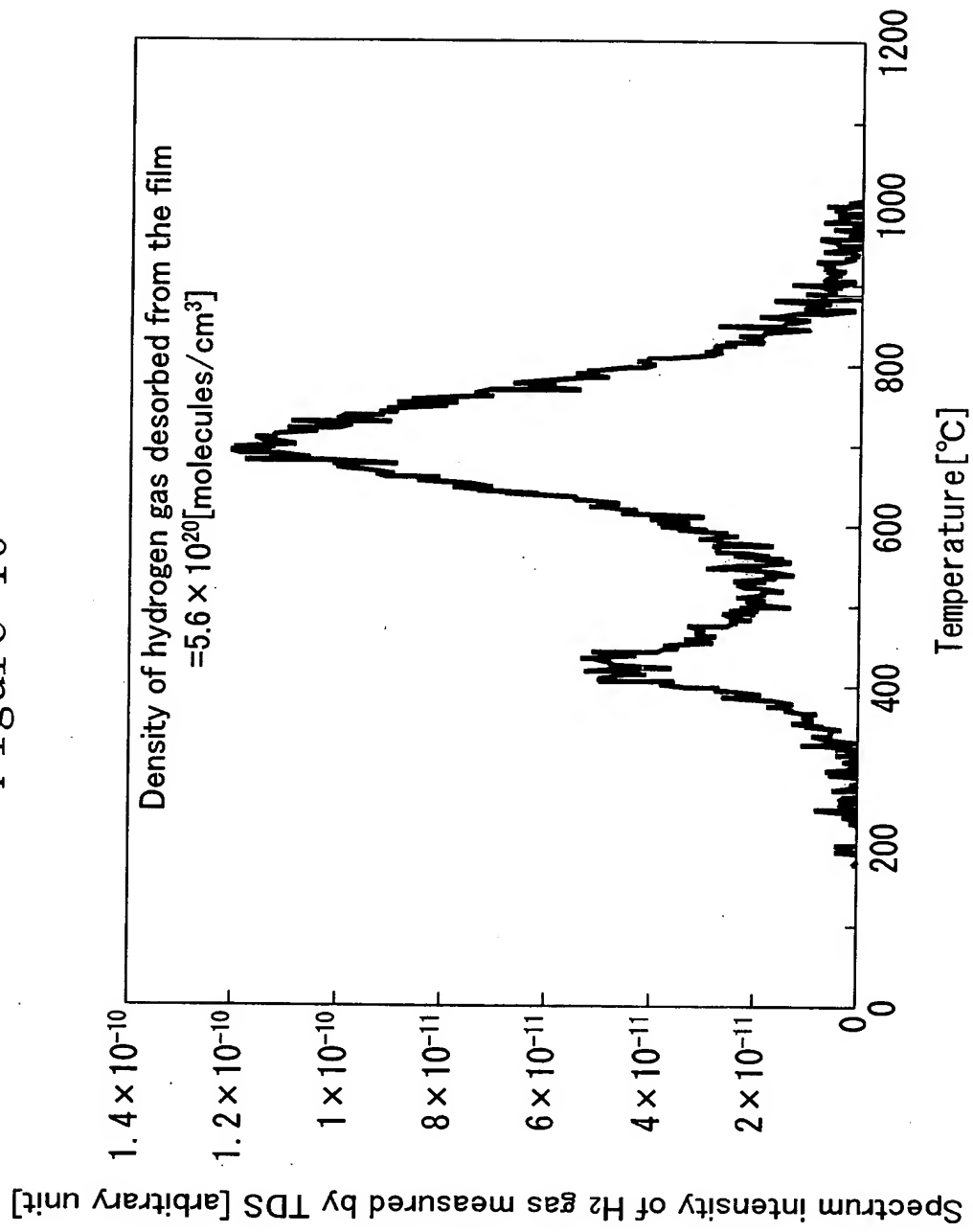


Figure 11

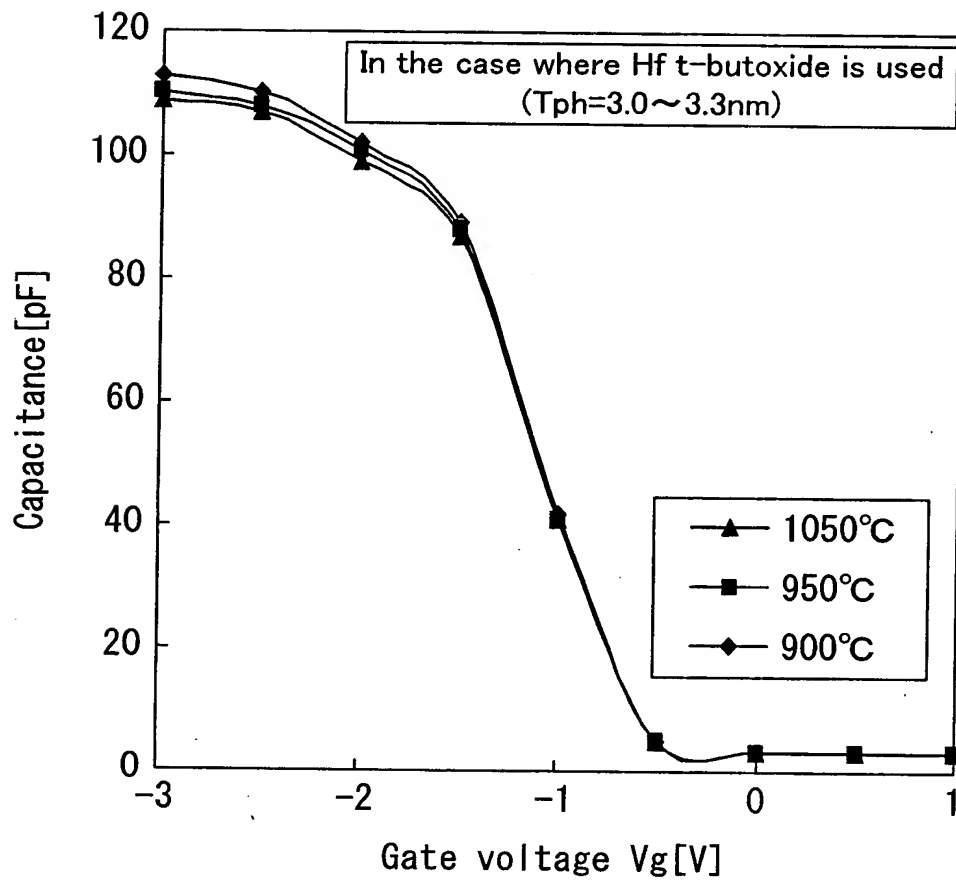


Figure 12

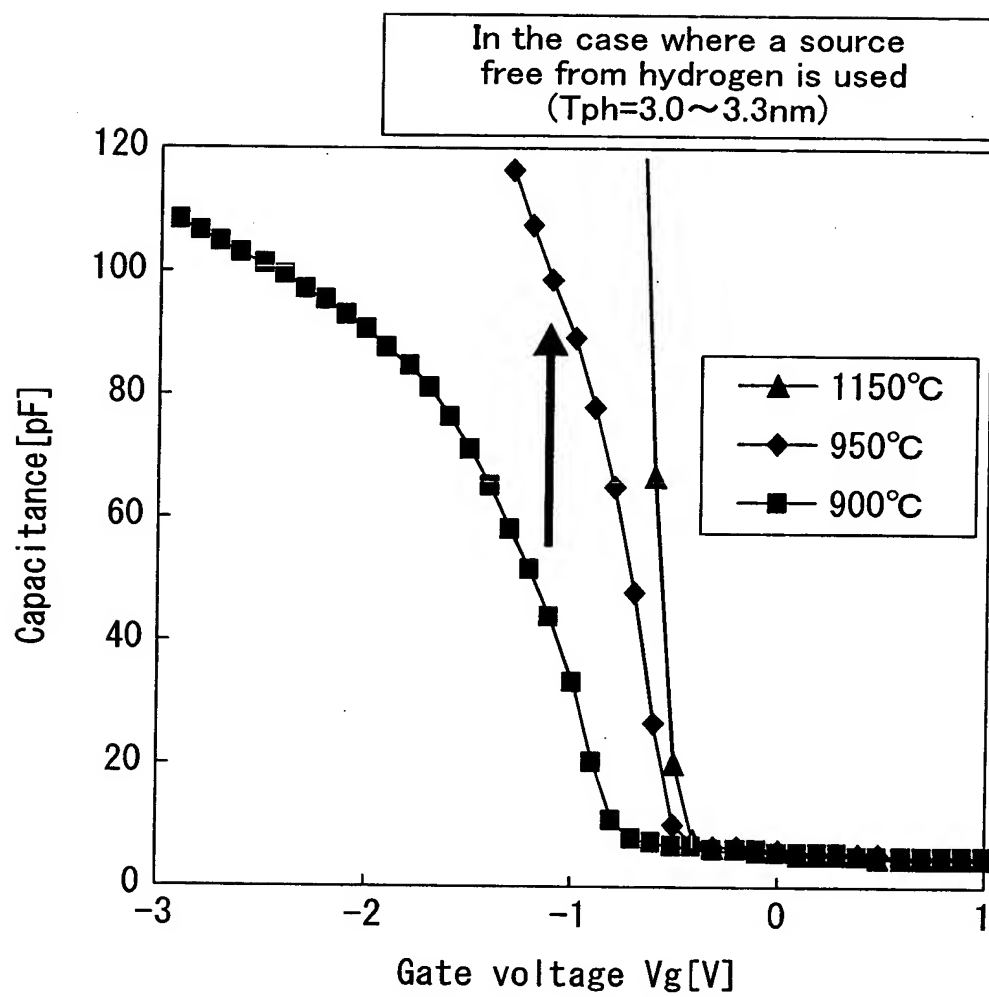


Figure 13

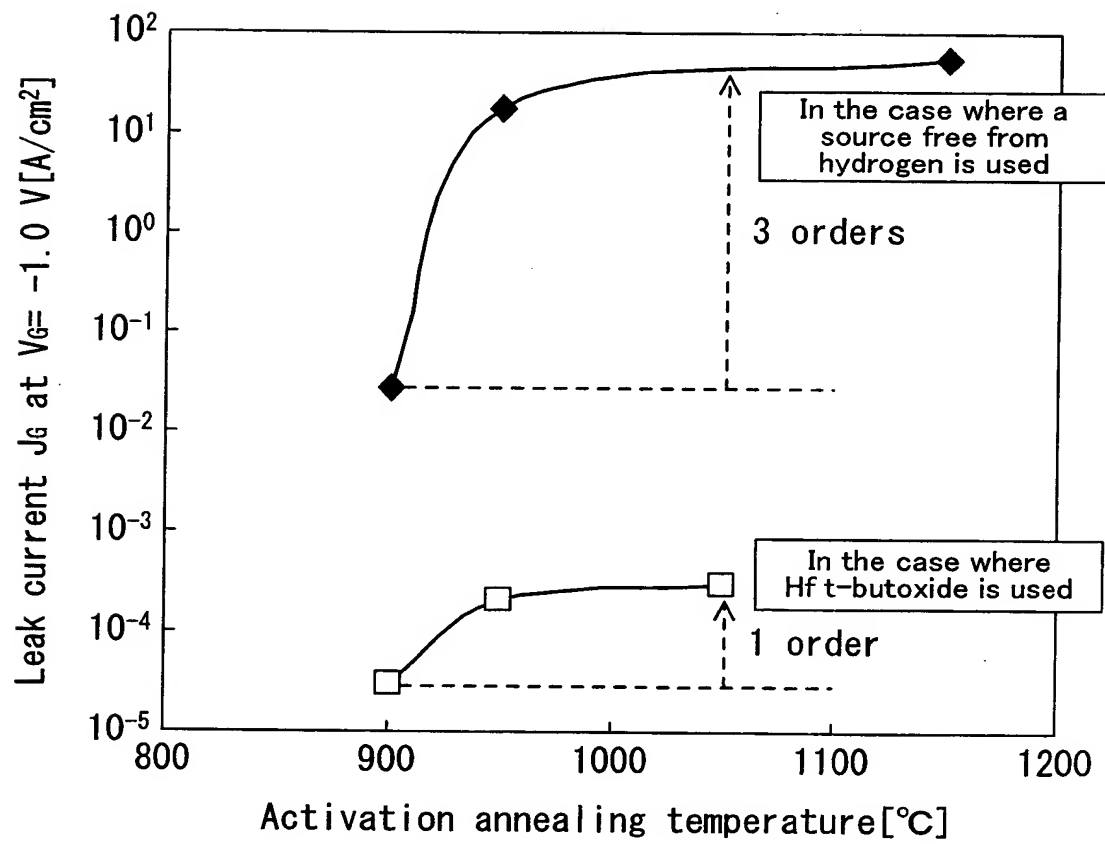


Figure 14

